After about twenty years I was able to solve the mysteries of furnace construction and discovered how to make furnaces which would work properly. I finally comprehended that each furnace could be represented as a hydraulic recipient or reservoir, that the problem of designing a furnace was nothing more than a problem in hydraulics, and that the circulation of the hot gases in the furnace was similar to the circulation of a light liquid within a heavier liquid.

Having arrived at this knowledge of furnaces, I found much pleasure in conveying it to my co-workers. I was thus confirmed in my belief that the hydraulic theory was clear, and presented to the human mind an exact and precise view of the problem, a true point of attack. The time necessary to acquaint a young engineer with the principles of furnace design was reduced to one month. An old employee \vho worked in the rolling mill and was well posted in regard to shop practice was able to understand the science of furnaces in a single evening, and I am satisfied that the subject was thoroughly understood by him.

Nevertheless rny problem was not completely solved; understanding the mechanism of the circulation of the hot gases was not sufficient. It still remained to establish the mathematical formulas for those laws, in order to compute the dimensions of the furnace. M. J. Yesmann, Professor of Hydraulics at the Polytechnic Institute of Petrograd, came to my assistance at this point. Professor Yesmann's formula for the inverted dam or weir W has been verified by me by its application to twenty existing furnaces. Having convinced myself that it was correct, I inserted the computation of reverberatory furnaces into the metallurgical course of the Polytechnic Institute of Petrograd.

It is true that the problem has not been entirely solved. A large amount of research work must be done in order to determine

the coefficients which are necessary to reduce these formulas to practice. I understand perfectly that my work is nothing more than the first step toward the solution of the problems of furnaces. It has caused and, I hope, will cause many others to undertake the tests which are required to complete the work.

For example, one objection which has been made is that I have made an error in assuming that a current of flame is similar to a current of incandescent gas. It is perfectly true that this is an

(1) Refer to pages 40 and 53.